Wind atlas of the Northern European Seas based on Envisat ASAR, QuikSCAT and ASCAT

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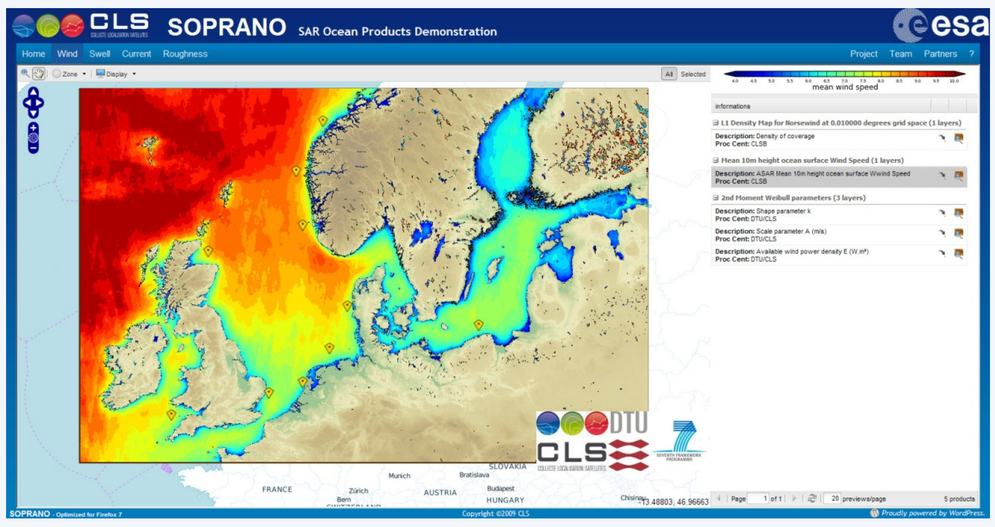
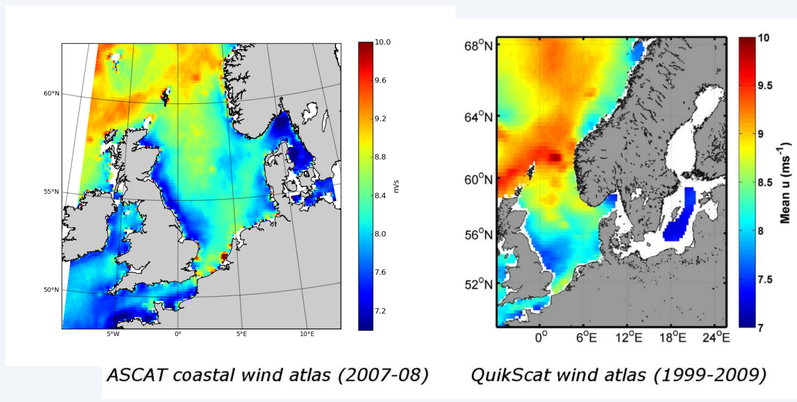
In the EU project NORSEWInD (Northern Seas Wind Index database, www.norsewind.eu) which lasted from 2008 to 2012 there was a goal of contributing a satellite-based wind atlas for the Northern European Seas. The effort included collection of more than 9000 Envisat ASAR WSM wide swath mode scenes covering the Baltic Sea, Irish Sea and North Sea during the years 2002 to 2012. The near-real-time processing to wind maps was done at CLS and DTU Wind Energy using various CMOD's and with *a priori* input of wind directions from the ECMWF and NOGAPS models. At CLS the in-house processing was used. At DTU Wind Energy the Johns Hopkins University Applied Physics Laboratory processing was used.

The study include inter-comparison of results between various CMOD's. The variations between CMOD5 and CMOD-IFR were only minor. It was decided to reprocess all maps with CMOD-IFR and use ECMWF wind directions as input to obtain a homogenous data set. This massive processing was done by CLS. Finally, the resulting wind fields were used in the S-WAsP software at DTU Wind Energy to calculate maps of the wind energy statistical parameters: mean wind speed, Weibull scale and shape parameters, energy density and uncertainty estimates, please refer to Hasager et al. 2012 for details. The number of overlapping scenes ranges from a few hundred in the Irish Sea to more than 1400 in parts of the North Sea and Baltic Sea. The more overlapping scenes, the less uncertainty is there in the resulting maps. The spatial resolution of the final maps is 2 km by 2 km. The maps are freely available through the web-sites http://soprano.cls.fr

Also QuikSCAT ocean wind vector maps from Remote Sensing Systems and ASCAT from KNMI OSI-SAF were used to assess the wind climate. The analysis of QuikSCAT ocean winds included wind speed and direction comparisons against observations from selected offshore meteorological masts. The resulting wind maps of variations in winds across the Northern European seas in time and space are presented (Karagali et al. 2012 and Karagali et al. 2013). The analysis of ASCAT include comparison the mesoscale model WRF results (see Hahmann et al. 2012) on the modeling, and the comparison showed small variations (Hasager et al. 2012).



Mean wind speed by Envisat ASAR.



ASCAT coastal wind atlas (2007-08) *QuikScat wind atlas (1999-2009)*

References:

•Hahmann AN, Lange J, Peña, A, Hasager CB 2012. The Norsewind numerical wind atlas for the South Baltic. DTU Wind Energy. 53 p. DTU Wind Energy E; No. 0011(EN).
•Hasager et al. 2012 Norsewind satellite wind climatology, DTU Wind Energy-E-0007(EN), Roskilde, Denmark
•Hasager, C.B., Badger, M., Peña, A, Larsén, X.G. 2010 SAR-based wind resource statistics in the Baltic Sea, *Remote Sens.* 2011, 3(1), 117-144 ; doi:10.3390/rs3010117
•Karagali I., Badger, M., Hahmann, A., Peña, A., Hasager. C., Sempreviva, A.M. 2013 Spatial and temporal variability in winds in the Northern European Seas, Renewable Energy, Vol. 57, p. 200-210,
•Karagali I., Peña, A., Badger, M., Hasager. C. 2012 Wind characteristics in the North and Baltic Seas from the QuikSCAT satellite, Wind Energy, DOI: 10.1002/we.1565
•Peña, A, Mikkelsen, T, Gryning, S-E, Hasager, CB, Hahmann, AN, Badger, M, Karagali, I, Courtney, M (2012). Offshore vertical wind shear: Final report on NORSEWInDs' work task 3.1DTU Wind Energy. DTU Wind Energy E; No. 0005

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